

perforating wound, but with its tissues uninfected. Experiments on rabbits show that excessive distention of the intestines by complete obstruction may of itself produce death, just as in man, but cannot produce peritonitis, although the diminished movements of the diaphragm and intestines certainly favor its occurrence by reducing the absorptive power of the peritoneum. If, however, there is the least break in the continuity of the intestinal wall, even a superficial ulceration of the mucous membrane, micro-organisms will find an entrance, penetrate to the peritoneum, and peritonitis will follow.

Grawitz finds that tuberculous peritonitis is governed by the same laws as suppurative—both being due to micro-organisms. Therefore the same conditions favor the primary tuberculous forms, and the idiopathic suppurative peritonitis, and he gives a case in which ascites from cirrhosis of the liver was the predisposing cause for a primary tuberculous infection of the peritoneum. The secondary form is accordingly due to direct infection of the peritoneum by some neighboring tuberculous point.

Of the many practical deductions as to abdominal surgery to be drawn from this important essay we have room only to mention the necessity of avoiding raw surfaces in the peritoneal cavity, of a thorough toilet of the peritoneum, and of drainage in every case where any accumulation of fluid is likely to occur.

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GASTROTOMY FOR FOREIGN BODIES.

1. Gastrotomie wegen Fremdkörper. Von Dr. B. Credé. *Archiv.f. klinische Chirurgie*. Bd. XXXIII. Hft. 3.
2. A case of Gastrotomy, Digital Exploration of the Œsophagus, and Removal of Plate of Teeth. Recovery. Remarks upon the Operation and Observations upon the Anatomy of the Œsophagus. By Maurice H. Richardson, M.D. *Boston Med. and Surg. Jour.* 1886. Dec. 16.
3. A Successful Case of Gastrotomy, with Critical Remarks. By Augustus C. Bernays, M.D. *Medical News.* 1887. Jan. 1.

During the year 1886 four cases occurred in which foreign bodies, that had been swallowed, were removed from the stomach by means

of laparotomy and gastrotomy. In two of these cases artificial dentures, in one a table fork, and in the other a table knife, were the objects that had been swallowed.

That so many cases should have been reported within so short a time is the more remarkable from the comparatively few cases which hitherto have been recorded. The three papers, whose titles are given above, have as their *motif*, in each instance, a recent case. The fourth case was reported by Pollailon, of Paris, and is published in the proceedings of the Academy of Medicine, Paris, of Aug. 24, 1886.

As Credé remarks in the outset of his memoir, the swallowing of undesirable articles is a very frequent accident. Usually they are either vomited up or pass naturally through the intestinal canal, even when the body is so large that such an event would hardly seem possible. Occasionally such an object has, by reason of the irritation caused by it, produced adhesion of the stomach or intestine to the abdominal wall, and finally, having accomplished perforation of this covering, has escaped spontaneously, or has been removed by a simple incision. Quite a large proportion of the so-called cases of gastrotomy for foreign bodies belong to this class. The following table of these cases is given by Richardson :

CASES WHERE THE STOMACH WALL IS INJURED AND ADHERENT TO ABDOMINAL
PARIETES.

No.	Operation.	Nature of Body.	Stay in Stomach.	Result.
1	Florian Mathis, 1602.	Knife.	51 days.	Recovery.
2	Wesener, 1692.	Knife.	10 months.	"
3	Hülner, 1720.	Knife.	11 days.	"
4	Frizac, 1786.	Knife.		"
5	Cayroche, 1819.	Silver fork.	7 ² / ₃ months.	"
6	Bertherand, 1823.	Silver spoon.	7 days.	"
7	Fideli, 1836.	Brass fork.	2 ¹ / ₂ years.	"
8	Hohlbeck, 1858.	Iron fork.	6 ¹ / ₂ months.	Death.
9	McKee, 1879.	Copper wire.	3 ¹ / ₂ months.	Recovery.
10	Fleury, 1880.	Fork.	2 months.	"
11	Gerard, 1882.	Wood.	6 weeks.	"

The surgical interference in such cases as these is of the simplest possible character. The cases themselves illustrate the conservative efforts of nature, the work of the surgeon having been simply to hasten

or guide an expulsion that was being accomplished spontaneously. The only case with fatal result that is included in the table, that of Hohlbeck, was not a result of surgical intervention, but took place three months later from caries of the sternum and ribs, presumably a sequel to the suppurative inflammation occasioned by the foreign body in its course of reaching the surface of the body. All these cases, which figure largely in the records of cases accumulated in the papers of Credé and of Richardson, ought hereafter to be eliminated from the statistics of gastrotomy, although they remain of interest in connection with the possible results of large foreign bodies that have been swallowed. It is evidently impossible, however, to use them for comparative purposes in estimating the dangers from the presence of such bodies in the stomach, for there is no possibility of obtaining a companion list of the cases in which this conservative adhesion with the abdominal parietes, before the perforation of the stomach wall, has failed to take place, and fatal peritonitis, or exhaustion from malnutrition, or irremediable obstruction of the intestinal canal at some point farther along in its course, has resulted.

A second table of incompletely reported or not well authenticated cases, is given by Credé and by Richardson. Some of these evidently belong to the class already commented upon above, while others are probably cases which properly come under the classification of gastrotomy. Unfortunately the incompleteness of the reports makes them useless for statistical purposes. The following is the list given by Richardson, omitting the cases of Bernays and Pollailon, which are now fully reported :

INCOMPLETE OR NOT WELL AUTHENTICATED CASES.

No.	Operation.	Nature of Body.	Result.
1	Reynaud.	Fork.	Recovery.
2	Dr. L——.	Silver spoon.	"
3	Garcia, 1830.	Stick of wood.	"
4	Glück, 1856.	Laryngeal probang.	Death.
5	——, 1856.	Fork.	Recovery.
6	Bouchet.	Silver fork.	Unknown.
7	Felizet, 1880.	Spoon.	Recovery.
8	Hashimoto, 1882.	Tooth brush.	"

The number of reported cases of gastrotomy proper, for the removal of foreign bodies, is reduced by the exclusion of the two classes of cases just mentioned to thirteen or a possible fourteen. Richardson, among the synopses of cases which he gives, includes a case which does not appear in either Credé's or Bernays' tables. This is the more strange since it is referred to a comparatively recent German source—*Berlin klin. Wochenschrift*, 1880—which Credé would not have been likely to overlook, especially as he claims to have taken great pains in the thorough and critical examination of the reports hitherto published. Richardson reports it thus :

1880. Billé's case. This patient used a pencil covered by a sponge, and the whole attached to a new silver wire 50 centimetres long, for the purpose of clearing the slime out of his œsophagus. May 2, 1877, it broke off, and part was left in the œsophagus. Billé first did an œsophagotomy at the level of the hyoid bone, but was not able to grasp the wire. Later he did gastrotomy by an incision through the abdominal wall and peritoneum, $3\frac{1}{2}$ centimetres long, 'two fingers' breadth below the margin of the ribs. An incision $2\frac{1}{2}$ centimetres long was made into the stomach, which was made solid with the abdominal wall before incising the mucous coat. The sponge was felt near the pylorus. This was seized with a pair of forceps and the whole extracted. The upper end of the wire was in the lower extremity of the œsophagus. The whole fragment was $31\frac{5}{10}$ centimetres long. Patient died five days after operation.

Of the other thirteen cases Bernays gives a very complete and valuable synoptical table which is herewith reproduced.

TABLE OF GASTROTOMIES FOR THE REMOVAL OF FOREIGN BODIES, IN WHICH THERE

<i>Case, Sex and Age.</i>	<i>Operator.</i>	<i>Foreign Body</i>	<i>Time in Stomach.</i>	<i>Condition before Operation.</i>
I. M. 22	Schwabe, Baldinger's Neues Mag. i. Aertze, B. xiii., 1791, p. 67; Berliner klin. Woch., No 7, 1883; Hartknock's Atlas und Neues Preussen, 1684.	Table knife 6 1-4 in. long, 5-6 in broad.	41 days.	No serious inconvenience.
II. F. 32	Tilanus, Ort. Diss. continus causum gastrotomiz cet. Lugduni, Batavorum, 1853.	Silver fork, 8 1-2 in. long, and some fragments of crockery, triangular in shape, largest piece being 7-8 in. in its greatest length.	3 days.	Very weak; great difficulty in swallowing. Diagnosis confirmed by sounding and by examination of region of stomach.
III. M. 27	Bell, The American Journal of the Medical Sciences, July, 1855, p. 272.	Bar of lead 9 in. long, 1-5 in. in diameter.	9 days.	No serious inconvenience at the beginning; on the 6th day vomiting and great prostration. Palpation failed to reveal the presence of a foreign body.
IV. M. 18	Labbé, Gazette Hebdomad, Deuxieme Serie, xiii. (xxiii.) 18, 1876, p. 273.	Five-tined German silver fork.	2 yrs. and 10 days.	No serious inconvenience for six months. Later on attacks of syncope and symptoms of severe gastralgia came on.
V. M. 37	Kocher, Correspondenz-Blatt für Schweizer Aerzte, 1883, Nos. 23 and 24.	Piece of a broken instrument (a probang with bucket).	1 day.	No serious inconvenience.
VI. M. 19	Gussenbauer, Wiener medizinische Wochenschrift, 1883, Nos. 51 and 52.	Broken sword-blade, 10 3-4 in. in length. Point rounded off; broken end rough and jagged.	2 days.	Great pain. Emetics and inversion of body tried first. High fever, vomiting and hiccough.
VII. F. 15	Schoenborn, Langenbeck's Archiv. für Chirurgie, B. xxix, p. 609.	Hair tumor, reniform and very hard.	About 4 years.	Vomiting; a freely movable tumor in the left hypochondrium could be felt.

EXISTED NO ADHESIONS BETWEEN THE STOMACH AND ABDOMINAL WALL.—(Bernays).

<i>Operation.</i>	<i>After-treatment and Remarks.</i>	<i>Final Result.</i>
Incision $1\frac{1}{2}$ in. below and parallel to ribs on left side. Stomach pulled out by means of a curved needle, cut through on point of swallowed knife. The incision "snapped shut" after knife had been extracted. Abdominal incision closed with five sutures; operation without anæsthetics.	External sutures removed on 2d and 3d days. Bloody urine and stools during first two days. Wound washed with wine; strict diet for two days, in which time wound entirely healed.	Patient for many years enjoyed perfect health.
Etherized. Incision in the linea alba, 3 in. Stomach drawn up with two forceps and opening made into anterior wall, 1 in. in length, causing considerable hæmorrhage. Search for fork and crockery very troublesome. Stomach was closed by five sutures, whose ends hung out of lower end of the abdominal incision, which was closed by ordinary suture.	Vomiting of a greenish fluid; pain and tympanites during the first 2 days. Feeble and high pulse during 2d day. Death on 3d day.	Post-mortem showed plastic material which caused adhesions between stomach, liver and abdominal parietes. Gastric incision entirely closed. Stomach much distended. Upper third of œsophagus much lacerated and perforat'd opposite larynx. A pus sinus along lobe of thyroid.
An incision beginning at second false rib, 4 in. in length, and in a direct line toward the umbilicus. A small incision was made into the stomach upon the bar of lead. After extraction contraction of stomach closed the opening. Pro-lapse of some of the intestines during the operation. Abdomen closed by interrupted suture.	Symptoms of gastritis immediately after operation. Injections of morphine freely given; patient discharged in two weeks.	Complete recovery.
Futile attempts were made to cause adhesion between stomach and parietes, by means of external applications. Laparotomy parallel to ribs; incision less than 2 in. Stomach pulled out by forceps and attached to abdominal incision before opening. Fork extracted with polypus forceps.	A strong collodion cuirass was applied to the abdomen. Solid food after fifth day. Wound healed kindly, leaving gastric fistula. Patient discharged on 15th day, a small gastric fistula remaining (purely gastrotomy).	Recovery. (It is not stated how long the fistula persisted).
Oblique incision $\frac{1}{2}$ in. from edge of ribs, stomach drawn up by two loops of thread. Incision in stomach over 1 in. long; was closed by 10 Lembert sutures.	Careful diet; no fever. Union by first intention.	Complete recovery.
Blade extracted with great difficulty after a large opening had been made in stomach.	Death in two days; due to septic peritonitis.	Post-mortem showed that stomach had been perforated by the point, and œsophagus by broken end.
Laparotomy in linea alba. Tumor lying loose; incision in stomach large and parallel and between the curvatures. Wound closed by 65 Madelung sutures.	Union by first intention. In three weeks she was discharged.	Complete recovery.

TABLE OF GASTROTOMIES FOR THE REMOVAL OF FOREIGN BODIES, IN WHICH THERE EXISTED

<i>Case, Sex and Age.</i>	<i>Operator.</i>	<i>Foreign Body.</i>	<i>Time in Stomach.</i>	<i>Condition before Operation.</i>
VIII. F. 17	Thornton, Lancet 1884, No. 3.	Hair tumor, weighing 2 1-4 pounds.	Several years.	An abdominal tumor was revealed by palpation. Patient very much emaciated
IX. F. 19	Billroth, Von Hacker, Magen Operationen in Prof. Billroth's Klinik von 1880 bis 1885. Vienna, Toeplitz & Deutsche, 1885.	Artificial denture, six teeth	2 days.	But little inconvenience.
X. M. 24	Crédé Von Langenbeck's Archiv. für Chirurgie, B. xxxiii., p. 574, 1886.	Hard rubber denture; eight teeth and clasps	15 days.	Vomiting and insomnia, accompanied by great nervous excitement.
XI. M. 25	Pollailon, Procédés de l'Académie de Méd., Aug. 24, 1885.	A fork.	A few days.	But little inconvenience.
XII. M. 27	Richardson, Boston Med. and Surg. Jour., vol. cxv., No. 24, 1886.	Artificial denture, four teeth and clasps.	11 mos.	Greatly emaciated; foreign body was situated in the lower part of the cesophagus, just above the cardia.
XIII. M. 38	Bernays, the Medical News, Jan. 1, 1887.	Silver-plated, metallic table knife, 9 1-4 in. long.	1 hour nearly	Frequent paroxysmal contractions of the stomach which, however, did not produce emesis.

NO ADHESIONS BETWEEN THE STOMACH AND ABDOMINAL WALLS. (Bernays)—Continued.

<i>Operation</i>	<i>After-treatment and Remarks.</i>	<i>Final Result.</i>
Tumor filled entire cavity of stomach. Incision in stomach closed by several tiers of sutures.	A sponge was left in the abdominal cavity, but was removed on the 28th day by reopening incision. Had double parotitis and concomitant fever.	Complete recovery.
Incision $4\frac{1}{2}$ in. along border of ribs and beginning at ensiform cartilage. Stomach held by two loops of thread and denture extracted through a small opening, which was closed by a number of ordinary external, interrupted sutures, and then these were buried by two rows of Lembert sutures.	The healing unaccompanied by any febrile symptoms. Left hospital 5 weeks after operation.	Complete recovery.
Oblique incision, 5 in., parallel to ribs and beginning at ensiform cartilage. Foreign body was found near pylorus. Incision in stomach 2 in. Three rows of sutures used.	No vomiting or febrile disturbances. 21 days after the operation was discharged.	Complete recovery.
Transverse incision, 7 cm. long; stomach pulled out by two needles, incision 3 cm. long. Fork pulled out with forceps. Wound united with catgut sutures. Stomach replaced, external wound closed by 8 sutures.	Union by first intention.	Complete recovery.
Oblique incision parallel to ribs. Stomach pulled out, and an incision made long enough to admit hand and forearm. Extraction of foreign body with fingers, considerable difficulty experienced before it could be brought through the cardia and into the stomach. Mucous membrane united by a continuous silk suture. The peritoneal surface united by 36 fine silk Lembert sutures.	Union by first intention, with exception of some stitch-hole suppuration.	Complete recovery.
Five-inch incision in linea alba, between xiphoid cartilage and umbilicus. Stomach drawn up by two "Army" bullet forceps. Incision about $\frac{5}{8}$ in., upon the handle of the knife. Gastric wound closed by five interrupted catgut sutures and then buried by 8 Lembert stitches, in one row. 18 sutures closed the abdominal incision.	Union by first intention. Fed per rectum; a little water allowed. No fever and no vomiting. Patient up and about ten days after operation.	Complete recovery.

One cannot fail to be struck with the uniform good results that have been secured in these cases—of the thirteen cases in the table but two failed to make a prompt recovery, those of Tilanus and Gussenbauer, and in both there were special complications to which the unfortunate event is fairly referable. In the case of Tilanus, the patient is stated to have been very weak at the time of operation, the foreign bodies were multiple, the search required for the detection and removal was very troublesome; the stomach sutures were left long and brought out through the abdominal incision determining a peritonitis—as the autopsy showed—which caused adhesions between the stomach, liver and abdominal parietes. To this the peritonitis may reasonably be attributed, also the vomiting, pain and tympanites which immediately followed the operation. In Gussenbauer's case the fatal peritonitis had already developed before operative interference. The results in the remaining cases are such as to encourage prompt operation, and to warrant the expectation that recovery will ensue provided reasonable judgment is exercised in the selection of the operative method.

In any case where a foreign body has been swallowed too large to be voided *per vias naturales*, the first question for the surgeon's consideration must be, how long operative interference should be delayed! The example of Bernays would give as an answer, no longer than is necessary to make the required arrangements for the operation? Within an hour from the time that the object was swallowed the operator had extracted it. The special haste in resorting to operation in this case was due to the fear on the part of the surgeon that the violent attacks of retching that the presence of the knife in the stomach was provoking, might cause the stomach to be perforated, or otherwise seriously injured.

Reference to the table will show that in a considerable proportion of the cases no serious inconvenience for some time was caused by the presence of the foreign body in the stomach; in other cases vomiting, pain, and progressive emaciation resulted; these latter symptoms also supervened in some of the cases that at first were free from inconvenience. In the present state of experience on the subject, the conclusion seems a fair one that, if an operation is to be made at all, the

earlier it is done the better, provided the proper conditions for the safety of the patient during and after the operation are obtainable.

Where shall the preliminary incision through the abdominal wall be made?

On the left side an oblique incision at a little distance from the ribs, and parallel to them, has been the most frequently chosen, but equally favorable results have followed the use of transverse and of longitudinal incisions in the linea alba. Credé and Richardson used an oblique incision; Pollailon a transverse one, and Bernays a longitudinal one. The oblique incision in the left hypochondrium exposes the stomach more centrally, but it is not so favorable for explorative purposes, nor is the anatomical arrangement of the structures involved in this incision so simple, and therefore so favorable to prompt and sound healing as in the linea alba. If the foreign body can be felt by manipulation through the abdominal wall, its location, thus ascertained, ought to determine the site of the incision. The particular direction of it will then be determined by the view which the operator may entertain as to the advisability of avoiding such vessels and nerves as may be involved in the region, or of preserving muscles intact, or by the vicinity of the receding border of the costal cartilages. Bernays made a five-inch long incision in the linea alba midway between the ensiform process and the umbilicus. After opening the peritoneum, he introduced his hand into the cavity and, feeling the knife lying in the long axis of the stomach with its handle near the pylorus, he grasped this handle through the stomach wall and conducted it out of the abdominal incision, covered by the anterior wall of the stomach which was pushed before it. The protruding viscus being then steadied between two pairs of forceps, an incision just large enough to permit the knife to be pulled through, not over five-eighths of an inch long, was made, and the knife delivered, without the escape of a drop of the contents of the stomach.

Richardson's case involved manipulations of a much more extensive character. His patient was a man, thirty-seven years of age, who, eleven months before, had swallowed an artificial denture consisting of a plate about the size of a silver half-dollar, to which four teeth were

attached. This had lodged in the œsophagus, fourteen inches from the incisor teeth, just above its point of entrance into the stomach. The man, who was robust at the time of the accident, had become extremely emaciated; could with difficulty swallow enough liquid food to keep him alive, and was suffering constant and severe pain in the epigastrium and back. The operation was undertaken with the purpose of reaching the foreign body through the stomach, and having dislodged it to bring it down into the stomach and then deliver it. The operation was entirely without precedent, but was successfully accomplished, as follows :

“An incision about six inches long was made one and one-half inches below and parallel to the margin of the ribs in the left hypochondrium. It began at the outer border of the *rectus abdominis*, three inches from tip of ensiform cartilage, and extended outwards and downwards. The abdominal wall was rapidly cut, layer by layer, until, all bleeding having been stopped, the peritoneal cavity was opened. The abdominal opening was held up by means of a T-hook at each extremity. The stomach was found lying empty in its usual position. An external examination was made of the cardiac orifice and of the whole stomach, to see if the foreign body might not be found and dislodged by manipulations. Nothing could be detected either in the stomach or the diaphragmatic opening. The stomach was now drawn out of the abdominal wound as far as possible, and placed upon a carbolized towel, and in this position all the subsequent manipulations were done. A small incision about one and one-half inches long was first made through the anterior wall of the stomach, beginning near the pylorus, and extending upwards and backwards midway between the greater and lesser curvatures. The walls were very thick and vascular. After cutting through the peritoneal and muscular layer, a dense network of large and tortuous vessels came into view, which, on being divided, bled very profusely. This was controlled by smooth-bladed hæmostatic forceps.

After two unsuccessful attempts to introduce grasping instruments into the œsophagus through this small opening, the incision was enlarged sufficiently to admit the hand and forearm. The stomach was

first wiped out with sponges and held with T-hooks. The walls of the diaphragmatic opening were found with some difficulty after passing the hand seemingly a very great distance. The middle and index fingers were then pushed up the œsophagus between the heart in front and aorta behind until the plate was felt, with the teeth pointing downwards, apparently embedded in a mass of soft granulations. The hand was withdrawn, and long-bladed forceps introduced into the œsophagus, guided by the index finger, but attempts to grasp the plate were unsuccessful. A hand was then re-introduced, and by careful manipulation with the index finger, succeeded in detaching the left extremity of the plate from its bed in the left side of the canal. The other extremity was then loosened from the right side, and the plate passed easily into the grasp of the fingers, and was withdrawn from the stomach."

As to the manner in which the stomach wound should be treated, there is no difference in opinion. It is to be sutured and the stomach dropped back into its place. The experience which has accumulated in the operations for resection of the stomach for cancer has established the method of procedure in other stomach-wounds. The cut edges are first carefully stitched together by a row of closely set sutures—preferably interrupted—that do not involve the mucous surface, but embrace only the peritoneal, muscular and submucous coats. These are then reinforced by a row of Lembert sutures. Fine silk will always give satisfaction for making these sutures.

The external wound is to be closed in the same manner as after laparotomy, by deep and superficial sutures covered with some soft and absorbent protective dressing.

The after treatment involves abstention from food by the mouth for the first four or five days, a little water only being occasionally allowed, rectal alimentation being depended on.

The experience of Dr. Richardson, in the case detailed, led him to make a series of tests as to the readiness with which foreign bodies impacted in various parts of the œsophagus could be reached, either from above by œsophagotomy, or from below by gastrotomy. From his observations he thinks it may be asserted that *there is no part of*

the human œsophagus which may not be reached, or very nearly reached with the finger either by gastrotomy or by œsophagotomy. Also that with the finger as a guide instruments may be used with intelligence upon any part of the canal.

With regard to the treatment of bodies impacted in the œsophagus his conclusions are as follows :

When all other means have failed, and the foreign body is found by measurement to be within reach by œsophagotomy, this should be done as soon as serious symptoms appear. If it is found that the body is within reach from below, that is, more than thirteen, possibly twelve inches from the incisors, and if the patient is in danger, as shown by constitutional symptoms, or imperiled by starvation, the stomach should be opened immediately, and attempts made to dislodge. If the symptoms are not urgent, a reasonable time should be allowed for natural efforts to aid in expulsion, but the operation should be done early enough to prevent the secondary changes of ulceration and perforation. If it is demonstrated that the foreign body is beyond the reach of œsophagotomy, and yet too high to be easily reached by the fingers from below, suitable instruments should be introduced through the stomach, guided by the finger, if necessary, for cutting, crushing, grasping or pulling down.

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